

# PSYCHOLOGY TEACHERS UPDATE

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1. CONSCIOUSNESS
2. CONSUMER BEHAVIOUR

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## PSYCHOLOGY TEACHERS UPDATE

Psychology Teachers Update is designed to give a brief overview of the main developments in the different areas of psychology. There is a proliferation of journals and research, and it is very difficult to keep abreast of the latest trends, particularly in the many and varied areas of psychology.

Each issue of Psychology Teachers Update will cover a particular topic, and summarise the main research directions and findings in the last ten to fifteen years approximately. The aim is to give teachers the feel of what is happening in that area of psychology.

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# CONSCIOUSNESS

## INTRODUCTION

As early as the 1902 meeting of the American Association for the Advancement of Science (AAAS), anatomist Charles Sedgwick Minot announced that: "I hope to convince you that the time has come to take up consciousness as a strictly biological problem" (quoted in Staff Writer 2007). Over one hundred years later, a simple biological explanation has not resolved the enigma of consciousness.

Braisby (2002) began with this observation:

Consciousness presents us with something of a mystery. It is a pervasive feature of our mental lives: we all experience being conscious and we all know what it is to not be conscious.. Yet despite this feeling that consciousness should present no mystery, it continues.. to frustrate all attempts at explanation; it is something of a theoretical bar of soap - the firmer the grip we try to establish, the nearer it is to eluding our grasp altogether (pp171-172).

Part of the problem is that consciousness was not seen as a topic for scientific study for much of the twentieth century, and it was viewed as the subject matter of philosophy, particularly when deeper questions arise in relation to it. Cognitive psychology and neuroscience have been responsible for the recent scientific interest, though approaches like the Humanistic have always include consciousness in their areas of focus.

Consciousness is unlike other areas of study in psychology in many ways (Braisby 2002):

i) Though consciousness is about the here-and-now, it can only be described in the past. As soon as I say how I am consciously aware of something, I have described a memory of that thing.

ii) The process of consciousness is about the contents of consciousness. When individuals are asked to describe their current conscious experience, they end up describing what they are conscious of, like the ticking of the clock in the room or their bodily processes.

iii) Consciousness is not easily described in language. Also different terms are used, like "awareness". On the other hand, language itself could determine the conscious experience.

iv) The "raw feeling" of consciousness is even harder to pin down because the description of what the person is conscious of, is usually a description of what is coming into the senses. "To imagine something of the essence of consciousness we need to imagine what would be left of our descriptions if all references to other psychological processes and objects were stripped away" (Braisby 2002 p177).

It is not possible to cover all the ideas related to consciousness, and table 1 summarises other issues and questions about consciousness.

- Not all information available to conscious mind: non-conscious vs unconscious
- Relationship between consciousness and brain (traditionally seen in the mind-body problem)
- Different types of consciousness
- Relationship between consciousness and self
- Knowing and not knowing our consciousness
- Humans compared to non-humans and machines

Table 1 - Summary of issues and questions related to consciousness.

Another problem is definition. "There is no universally accepted definition of consciousness. Most conceptions of consciousness include qualities of mind such as subjectivity, sentience, self-awareness and/or the ability to perceive the relationship between oneself and one's environment" (Langley 2006 p15).

Searle (1999) prefer to cite the three features of "conscious states":

- Inner - "Consciousness can no more lie around separate from my brain than the liquidity of water can be separated from the water, or the solidity of the table from the table" (p41).
- Qualitative - Each conscious state has a feeling of the way it is.
- Subjective - It only exists from the point of view of the experiencer.

At the same time, Searle (1999) pointed out the mistake that "we must have a special kind of certainty when it comes to knowing our own conscious states" (p70). This is self-deception. The paradox of only we can access our consciousness, but our access make not be "accurate".

There are three key problems that occupy theorists

and researchers interested in consciousness (Datta 2004):

- Hard problem - how the subjective experience of consciousness comes from the physical brain;
- Easy problem - the neural underpinning of processes in consciousness;
- Binding problem - how information from the sense is combined to give the "unified feel" of consciousness.

## UNUSUAL EXAMPLES OF CONSCIOUSNESS

Because of the difficulty in pinning down an abstract phenomena like consciousness, it is easier to look at it through unusual examples. These often highlight the key questions and issues for the topic.

Firstly, there is the example of somnambulism, or more precisely, where individuals are able to perform complex behaviours while asleep. Sleepwalking involves automatism (where the individual has no voluntary control over their behaviour), but, at the same time, some "awareness" as they are able to perform certain tasks. This is seen at its most extreme, literally, in the murder committed by Ken Parks while asleep, which included driving across town (appendix 1).

Other unusual examples of consciousness are related to brain damage, like visual neglect and blindsight. Visual neglect is where the individual fails to attend to a certain part of the visual environment. For example, PS (Marshall and Halligan 1988), a 49 year-old woman, had damage to her right parietal lobe which produced unilateral neglect on the left side.

A typical test of this condition is to show the patient two pictures of the same object except for a small difference, like pictures of a house, but one is on fire. When the house on fire picture is presented on the left side, PS reported seeing two pictures exactly the same, but said she would prefer to live in the house in the picture on the right (ie: not on fire).

But this is not just a visual problem because patients asked to describe a familiar city square (in Milan) from memory, named only the buildings on the right side. Then when asked to imagine facing the opposite direction, they reported only buildings on the right again (which had originally been on the left) (Bisiach and Luzzatti 1978). Nor was it just a memory problem.

Blindsight is a condition where damage to the visual cortex has left an individual as "consciously blind" (ie: report seeing nothing), but they are able to accurately

guess the position of a shape in the visual field (Weiskrantz et al 1974) <sup>1</sup>. Recent work has suggested that such individuals can focus their attention in the blindfield without conscious awareness of any objects there (Kentridge et al 1999).

Cases like these show that not all information is available to the conscious mind, and that consciousness and the physical brain are inextricably linked (Braisby 2002).

## DIFFERENT KINDS OF CONSCIOUSNESS

Attempts have been made to distinguish the different kinds of consciousness. For example, Block (1991) talked of:

- "Access consciousness" - consciousness that is accessible to verbal report, and combines different mental processes like memory and perception.
- "Phenomenal consciousness" - this is the experience or feeling of consciousness. This is not easy to put into words.

Young and Block (1996) added "monitoring consciousness" and "self-consciousness". The former relates to self-reflection on actions and mental tasks. Monitoring consciousness can be an automatic process as shown by attentional slips (failure to monitor actions), like unwrapping a sweet and putting the paper in the mouth while throwing away the sweet (Reason 1979).

Self-consciousness is consciousness related to the concept of the self, and includes the experience of the self now as well as past and future perceptions of it.

Langley (2006) differentiated three levels of consciousness when comparing humans and non-humans (table 2).

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<sup>1</sup> See Psychology Teachers Update 20.1, January 2009 for more details.

CRITERIA	ANIMAL
Primary consciousness - ability to create a "mental scene" which can direct behaviour. It is also linked	Mammals, birds, reptiles and large-brained invertebrates (Seth et al 2005).
Secondary consciousness - ability to "have thoughts about experiences, especially about how external events relate to internal ones" (Langley	Monkeys and apes.
Tertiary consciousness - higher order cognition including sense of self and	Chimpanzees and some monkeys (eg: rhesus).

Table 2 - Different levels of consciousness and non-human animals.

## THEORIES OF CONSCIOUSNESS

There are many and varied theories to explain consciousness. The can be divided, in the main, into cognitive/computational and biological/neurobiological groupings. Cognitive theories tend to focus on the cognitive processes within consciousness, and biological theories are interested in how the mind is realised in the physical brain (Braisby 2002). Other theories look at the philosophical aspects or focus on the experience of consciousness.

The focus on the experiential nature of consciousness began with William James' (1890) "streams of consciousness", and through to Csikszentmihalyi's (1992) "flow experience".

Long before scientific approaches, ideas about consciousness were in ancient texts. For example, "Chetna" and "Aatma" were words used in Indian sacred texts to describe a non-material nature of consciousness (Prakash 2008).

One problem for researchers trying to explain consciousness is that "conscious experience is not a unitary object" but "can be best understood in terms of a set of various dimensions, similar to the space-time dimensions of universe (sic)" (Prakash 2008 p11).

Another problem comes in the form of the relationship between the physical and non-material (ie: mind-brain or mind-body problem). Dualism, developed by Descartes in the seventeenth century, proposed that the body/brain (physical) is separate from the mind/experience. Because they are separate, one cannot explain the other. While identity theory (eg: Jackson 1982) focuses on consciousness using the brain to achieve its purposes. So consciousness cannot be reduced to



physical properties only, as argued by reductionists like Dennett (1991).

## Cognitive Theories

Cognitive/computational theories can be divided into two types (Prakash 2008):

i) Information processing theories - phenomenal consciousness is explained in terms of special computational processes in the brain; eg: global workspace theory. One purpose of consciousness is to integrate brain activity which is otherwise separate groups of neurons (neuronal populations) firing.

ii) Representational theories - conscious experience is the property of the "representational vehicles" of the brain. How information is represented and stored in the brain produces phenomenal consciousness (as a by-product).

### Global Workspace Theory (GWT) (Baars 1988; 2002)

This is a recent theory in the computational (or cognitive) tradition, and is sometimes called the "conscious access hypothesis" (Prakash 2008). This means that the brain and what is happening within can be modelled in computer terminology and concepts.

The GWT makes a number of assumptions about the brain (Baars et al 2003):

i) The brain is "a collection of distributed specialised networks", including perception, attention, and memory. These networks include (Braisby 2002):

a) Specialised input processors - parts of the brain that process particular information non-consciously; eg: visual stimuli. These processors are efficient in their limited domain only, and are parallel processors;

b) Specialised receiving processors - parts of the brain that receive information from the global workspace.

ii) Potentially conscious brain activities compete for access to the global workspace. In other words, the most important activities of the moment will reach this global workspace (and become conscious) because the global workspace has a limited capacity.

iii) The brain contains "contexts" ("unconscious

networks") which shape the conscious experience. For example, aspects of visual perception will be unconscious, but their participation leads to conscious visual perception (ie: what we actually see).

"Contexts" also include learning, particularly in relation to problem-solving.

iv) Intentions and emotions can be "goal contexts" which motivate conscious experience without necessarily being conscious themselves.

v) The global workspace (a process rather than a structure) takes place in the prefrontal cortex of the brain.

Baars et al (2003) talked about the metaphor of "the theatre of the mind" and the global workspace as the spotlight on stage. While behind the scenes, "an invisible (unconscious) director and playwright try to exercise executive control over the actor and the spotlight" (p672).

Using another metaphor, the global workspace can be likened to a message board on an internet site (Braisby 2002).

There are links here to the models of selective attention where only certain stimuli can be consciously attended because of limited channels or limited capacity.

One prediction from this theory is that conscious perception involves more than just the sensory information as compared to non-conscious perception (Prakash 2008). Dehaene et al (2001) found that visual stimuli presented too fast to consciously perceive produced neural activity in the visual cortex, whereas consciously perceived visual stimuli evoked activity in many areas of the brain.

It is important to emphasise that this theory, like many current ones, is against the idea of a central place ("a Cartesian theatre") where consciousness lives and is controlled. The idea that there is a little person ("homunculis") inside the head who controls the whole brain is not accepted (Dennett 1991).

## Biological Theories

The biological/neurobiological approach seeks the physiological correlates for subjective conscious experience ("neural correlates of consciousness"; Datta 2004), including the reticular activating system, prefrontal cortex, and the thalamocortical loops (Prakash 2008).

There is also the search for a physiological

explanation of the conscious experience. For example, Koch described each conscious experience as the result of a unique set of neurons firing in a specific manner, while Greenfield preferred the idea that neurons across the brain co-ordinate and disband to explain conscious experience (Koch and Greenfield 2007).

Dennett (1991) proposed the Multiple Drafts Model of Consciousness. As the stream of information comes into the senses it is probed, and this produces the "stream of consciousness" feel. The probing of the stream of information at any point in time is the "experience" of consciousness. No one probe is definitive, and some may involve retrospective pre-datings. Consciousness can react forwards and backwards (ie: consciousness can monitor its own activities). This process has evolved.

In terms of the evolution of consciousness, changing, complex situations require novel solutions which consciousness aids. Early humans lived in social groups that required complex cognitive skills like recognition of individuals and recall of who to trust. Simplistically, consciousness evolved to help the individual maintain "control" of all the demands of such social groups (Toates 1996).

Damasio (1999)

Consciousness arises from the relationship between two types of neural patterns - organism-representations and external-representations. Organism-representations are those patterns related to the organism including the "proto-self", which maps "the state of the physical structure of the organism" (Braisby 2002). It is not available to consciousness, but it is the underlying basis of consciousness.

External-representations are produced by perception and map the external world. For example, if an object is moving towards the individual, external-representations perceive that occurring and organism-representations are bodily changes in response to that (ie: prepare to move). Consciousness is "experienced" as the interaction of these processes, and the interaction with an "extended consciousness" (an autobiographical self containing past experiences and future ideas). Together this produces core consciousness.

Damasio is interested in the physiology of the different components of consciousness, and has studied brain-damaged individuals to help map the brain regions involved. For example, in the case of anosognosia, the problem is the integration of the representations with the autobiographical self. Anosognosia is caused by minor

brain damage, as in a stroke, where the individual denies an illness or disability. DJ had complete left-side paralysis but denied it was so. This is not a person knowing one thing and saying another. The brain damage meant that DJ created elaborate explanations for why she could not move her left arm when requested. The ability to monitor the body has been impaired.

Similarly in asomatognosia. This is a condition where the individual cannot recognise their own body, or may even deny they have a body (Braisby 2002). In one case, after a stroke, LB pinched her own skin and reported that it did not feel like her body. This was a loss of the feeling of being embodied.

One problem is that Damasio does not explain how the experience or feeling of consciousness arises from the two types of representations. He is not able to explain phenomenal consciousness, even if he can explain the other types of consciousness (Braisby 2002).

Penrose-Hameroff orchestrated objective reduction (ORCH OR) model of quantum computation in microtubules within neurons (Hameroff 1998) <sup>2</sup>

The ORCH OR model makes use of principles in quantum theory (physics) to explain how conscious experience comes from the physical brain. Quantum theory is used to describe the unusual properties of matter at the atomic level. The properties include (Woelf and Hameroff 2001):

- Quantum coherence - individual particles act as a collective (Bose-Einstein condensation). This would account for the "unified feel" of consciousness;
- Non-local quantum entanglement - spatially separate particles are related (Einstein-Podolsky-Rosen correlations). This would explain the "connected feel" of memories as individual cells holding memory traces throughout the brain are related;
- Quantum superposition - particles exist in two locations or states simultaneously. This has been applied to altered states of consciousness including sleep, and non-consciousness;
- Quantum state reduction - superpositional particles become one of the choices. This is used to explain the shift from non-conscious to conscious processes.

These processes take place in the microtubules within neurons in the brain. Physical changes at this

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<sup>2</sup> This theory comes an original idea by Roger Penrose (1989).

minute level (nanometres) and very rapidly (hundreds of milliseconds) produce the qualia of consciousness.

The problem with quantum theory is that it only works at the atomic level and not with large objects including the brain (Mereli 2007).

## Philosophical Issues

The big philosophical problem for all theories is explaining the qualia of consciousness (phenomenal consciousness). This is the feeling/experience of consciousness, and how it arises from the physical brain. The qualia is more than just the physical description of the phenomena. This is also seen as the "hard problem" of consciousness. In other words, phenomenal consciousness is harder to explain even if other types of consciousness can be.

One solution to the hard problem", taken by Dennett (1991), is to deny the existence of phenomenal consciousness. What feels like the experience of consciousness is simply the product of perceptual processes.

Whether phenomenal consciousness exists is debated around thought experiments, like Mary (Jackson 1982). Mary is a scientist who has studied vision, and knows everything about it, like the wavelengths involved in colour and which neurons fire in vision. But she has lived all her life in a black and white room with a black and white television. "What will happen when Mary is released from her black and white room or is given a colour television monitor? Will she learn anything new or not?" (Jackson 1982 p130).

Those who focus on the physical processes of consciousness, like Dennett, would say Mary would learn nothing new. Though Dennett himself, believed it is too difficult to imagine Mary's understanding and so he does not like such thought experiments (Braisby 2002).

But the existence of qualia would mean that Mary does learn something because she is experiencing colour for the first time.

Looking at the hard problem in a different way is Chalmers (1996). "Experience" (in the sense of consciousness or qualia) exists in all objects because consciousness is more than just the product of physical components. He proposed the zombie thought experiment. In this scenario, a molecule to molecule replica of a conscious human being is made. Is this replica (zombie) conscious?

Answering "yes" supports the idea that consciousness is a product of physical components, while a "no" answer suggests that consciousness is something beyond the

physical. "After all, a human and a zombie might be identical in every detail including their molecular composition and yet the former would be conscious and the latter not" (Braisby 2002 p210).

On the other hand, it could be that consciousness is not amenable to scientific study, and that it is too complex for our understanding (mysterianism; Braisby 2002).

## Other Approaches

While there is interest in establishing the nature of consciousness, some researchers have focused upon the non-conscious ("thought processes that happen outside consciousness"; Douglas 2007)<sup>3</sup>. The distinction of conscious/non is called a number of things including explicit/implicit and automatic/controlled by cognitive psychologists.

The question is whether the conscious/non-conscious are parts of the same system or separate systems. In the case of the latter, for example, Daw et al (2005) have described four systems (two conscious and two non-conscious)(Douglas 2007):

- Pavlovian controller (non-conscious) - controls routine, reflexive, and instinctive behaviour;
- Habitual controller (non-conscious) - controls habitual, learned behaviour like driving;
- Episodic controller (conscious) - in control in unfamiliar situations, and when learning is new;
- Goal-directed controller (conscious) - rational decision-making.

In Halligan and Oakley's (2000) two-level model, most cognitive processes occurs at level 2 (non-conscious), which includes the central executive system (CES). Level 1 is conscious awareness and voluntary control. The CES creates the belief in the self, and maintains a consistent self and a biography along with the illusion of control<sup>4</sup>.

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<sup>3</sup> Non-conscious is preferred to unconscious, sub-conscious and pre-conscious which can have associations with psychoanalysis.

<sup>4</sup> Another debate relates as to whether we have free will and conscious control over our behaviour or not.

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## APPENDIX: THE CASE OF KEN PARKS AND "SLEEPWALKING MURDER"

In the early hours of 24 May 1987, a man drove fifteen miles across town in Ontario, Canada. he fatally stabbed his mother-in-law and injured his father-in-law, and then gave himself up at the nearby police station. This man was Ken Parks, and he performed all these actions in a state of somnambulism (sleepwalking) (Broughton et al 1991).

In court in 1990, he was acquitted of murder under the defence of automatism (first used in English law in the 1950s; McCall Smith and Shapiro 1997). This legal defence uses the argument that "individuals are not fully accountable for what they do in such states" (Levy and Bayne 2004).

Parks was 23 years old at the time of the murder, and he had a good relationship with his in-laws. He had gambled excessively, embezzled money, and lost his job before the murder.

The murder took place the night before he and his wife were due to visit the in-laws to confess about these events. At 1.30am, Parks fell asleep in front of the television, and then awoke in the house of the in-laws after the murder (Braisby 2002).

Parks had a family history of sleepwalking. On the night in question, he was suffering from sleep deprivation, was stressed, and had done a lot of physical exercise that day (three factors in sleepwalking) (Braisby 2002).

Cases of behaviour while sleepwalking, of which Ken Parks is one of the most extreme, raise three main issues:

- How is the individual able to do something like drive a car while sleeping (physiological question)?
- How can the individual not be accountable for their actions (philosophical question)?
- Where did the motivation come from to kill the in-laws (causation question)?

### PHYSIOLOGICAL QUESTION

This is a question of how Ken Parks drove across town while asleep. He must have been awake to do such behaviour (and thus lying about not remembering the murder) says commonsense.

But this assumes that sleep and waking is a simple on/off process. Sleep is a complex phenomenon (eg: REM

and NREM sleep), and waking is not one event, but many variations (eg: drowsiness, focused attention). There are many different states of consciousness in the 24 hour period. This is the conscious state hypothesis (Hobson 2005): consciousness changes as the brain state changes during the sleep/wake cycle.

Sleepwalking is an example of a parasomnia, which are complex behaviours that occur unusually during sleep. It happens during deep sleep (stages 3 and 4 NREM sleep), not during light sleep as commonsense would predict.

Studies of sleep and sleep disorders have shown that the normally distinct phases of wakefulness, NREM and REM sleep can overlap and interfere ("state dissociation"; Mahowald and Schenck 2005) (figure 1). The relevant case here is sleepwalking as NREM sleep mixed with wakefulness.

It is also possible that different parts of the brain are in different conscious states (eg: left occipital lobe EEG showing NREM sleep and right central EEG REM sleep in narcoleptic patient; Mahowald and Schenck 2005).

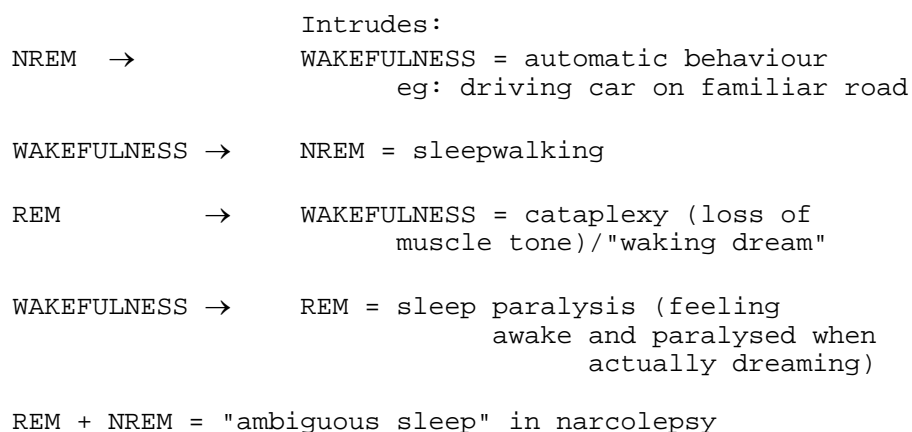


Figure 1 - Intrusions of different conscious states.

Often there is an abrupt waking (not completely) from deep sleep. So, in a situation like Ken Parks, the brain is enough awake/aware to monitor the driving behaviour, but still asleep in terms of conscious awareness of what doing. This is further developed in the next section in terms of the philosophical question of such "zombie" states (Braisby 2002).

There are a number of scientific documented cases of complex behaviour during sleepwalking (including playing a musical instrument, and eating). Schenck and Mahowald (1995) detailed a case of a 43-year-old man with a history of lifelong sleepwalking activities including frenzied running and violence. He was reported to have

driven a car during a sleepwalking episode ("somnambulistic driving").

#### PHILOSOPHICAL QUESTION

The commonsense view is that individuals choose to do something or not. This choice (or agency) carries consequences and responsibilities. But Levy and Bayne (2004) saw agency as having four types rather than the simple present/absent distinction:

- i) Deliberative agency - consideration of the consequences before the action is performed;
- ii) Conscious agency - awareness of the decision to do something without complete assessment of the consequences;
- iii) Automatic agency - behaviour that does not require full concentration, usually because it is habit;
- iv) Automatistic agency - "a class of conditions in which one acts without being fully conscious of what one is doing". It can be sub-divided into "global automatisms" (affecting the whole of consciousness) like somnambulism or trance states, and "local automatisms" ("a description of consciousness and control over a particular kind of action") eg: "automatic writing".

Levy and Bayne (2004) further distinguished these four types of agency in three respects:

- Deliberation - opportunity to reflect upon the actions;
- Character - actions as a reflection of a person's character;
- Control - ability to control behaviour.

Table 3 summarises the different types of agency.

Putting these ideas together for Ken Parks, somnambulism is a global automatism that "leaves the individual confused and without the resources of conscious control" (Levy and Bayne 2004). In this state, Parks acted out of character (he had no history of violence), with no control over his behaviour, and no ability to reflect upon the action.

The difference between automatistic agency and automatic agency is that with the latter, the individual can quickly resume conscious control. Automatic agency involves indirect monitoring. Neither of these occur with automatistic agency.

<u>TYPE OF AGENCY</u>	<u>EXAMPLE</u>	<u>DELIBERATION, CHARACTER, CONTROL</u>
DELIBERATIVE	Decide to leave job after careful consideration	Yes to all 3
CONSCIOUS	Choose to do something but more "spur of moment"	Some deliberation; yes to other 2
AUTOMATIC	Driving car along well known road	Limited deliberation; control if required
AUTOMATISTIC	Sleepwalking	No to all 3

Table 3 - Four types of agency.

In the legal (and moral) sense, Parks therefore has no responsibility for his actions. This type of event opens up many questions about consciousness and responsibility which normally go unaddressed.

#### CAUSATION QUESTION

Even if Ken Parks could drive across town and commit murder while asleep, and he was not legally responsible because of the automatic nature of the behaviour, why did he do it?

Parks himself had no explanation. Any suggestion must be speculation about the motives. Psychoanalysis has a possible explanation.

It is argued that during automatic actions, the individual is in a form of autopilot controlled by non-conscious parts of the brain. In psychoanalysis, this would be the unconscious mind (and the Id) (Freud 1923). Here live the "true" desires that are not acceptable in society. In normal consciousness, the unconscious desire to harm his in-laws is kept in check by the Ego, which also keeps such knowledge from the conscious mind. This is why Parks would not be aware of his desire to harm the in-laws. In Freudian theory, individuals do not consciously know such things, it is not that they are lying. Defence mechanisms used by the Ego, like repression, keep such information from the conscious mind (Freud 1936) (figure 2). This is crucial because conscious knowledge of these unacceptable desires could lead to major psychological problems.

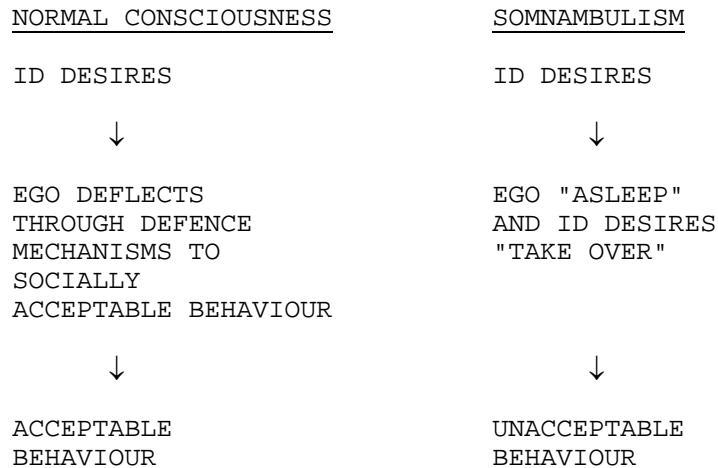


Figure 2 - Id and Ego in two states of consciousness.

In the state of somnambulism, the Ego is temporarily unable to be in control, and the Id "takes over", leading to Parks acting out the unconscious desires. The conscious mind is protected as afterwards he had little memory of the actions.

Because the murder took place on the night before Parks was going to admit to his in-laws about his gambling and embezzlement, the Id desired to remove the in-laws so he would not have to face the shame. But, if so, why did he only kill the mother-in-law, and strangle the father-in-law unconscious?

An alternative explanation for Park's behaviour is that of dissociation: "A person acting in a state of dissociation is not unconscious in the normal sense of the term; he is aware of his surroundings and responds to them, but does not relate these surroundings and his reaction to them to his normal self" (McCall Smith and Shapiro 1997 p48). It is a separation of consciousness as in multiple personalities (Dissociative Identity Disorder), for example, or in hypnosis. But this does not explain why Parks did what he did, it only describes it.

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# CONSUMER BEHAVIOUR

## INTRODUCTION

Consumer behaviour is behaviour that relates to the consumption of products (and services). Edwards (2000) distinguished three elements of consumption:

- Consumerism - about shopping and commodities;
- Leisure - consumption of services;
- Activity of consuming itself.

In Western society today, consumption is more than just an end process, it is the whole process than underlies (all) behaviour and society (Brewer 2001).

Consumer behaviour can be divided into consumer information processing (CIP)(eg: perception of brands) and behaviour decision-making (eg: which product to buy). These topics are applied versions of social and cognitive psychology. In fact, social psychology has influenced consumer research even more than marketing and economics (Shavitt and Wänke 2001).

## CONSUMER INFORMATION PROCESSING

CIP is how individuals make sense of information about products and brands. In CIP, the basic processes of social cognition apply:

### i) Encoding

Grabbing consumers' attention is assumed to be the best way to get the encoding of information about a brand or product. The exceptions to this rule are that full attention is not necessarily needed to encode product information, and consumers resent too obviously attention-grabbing advertising (Shavitt and Wänke 2001).

Factors that influence attention-grabbing include placement of the product (eg: advertisement on the back cover of a magazine; the product at eye-level on a supermarket shelf), and consumer motivation (eg: to find cheapest product; hunger)(Shavitt and Wänke 2001).

### ii) Retrieval

Accessibility of memories about brands has been explored through research on how brand-related information is stored. But, as with memories generally, information about a product or brand is not simply recalled in its original form, it includes judgments and inferences added at and after encoding.

## Consumer Categorisation

This area of consumer behaviour builds upon the general understanding of how individuals construct categories of objects in the world, and focuses upon "brand categories". This includes "the manner in which perception of new category members (brand extensions) are influenced by category beliefs and affect and also on how information about new category members reciprocally influence beliefs and attitudes about the category" (Loken 2006).

The process of brand extension involves consumers transferring their existing brand beliefs to a new product (Shavitt and Wänke 2001). However, this does not automatically mean that liking for the brand will be transferred to the new product because consumers may require something different from the new product (Broniarczyk and Alba 1994). For example, liking for "Smith's sports car" is not necessarily transferred to the new "Smith's family car" because these are two different items as far as consumers are concerned.

A brand category contains attributes (characteristics about that category) and exemplars. For example, the Ford make of cars is a brand category with attributes like reliability and status, and exemplars like Ford Focus and Ford Mondeo. The introduction of a new Ford type of car (a new category member) will relate to the brand category as a whole. Similarity (or perceived similarity) between the new category member and the present brand increases the acceptance of the brand extension. Also the typicality of the new member to the category as a whole will increase liking (Loken 2006).

Positive mood increases the likelihood of seeing the new category member as similar to the parent brand (Barone et al 2000), as does repetition of exposure (Lane 2000). Barone et al manipulated the mood of seventy-four students of business studies with unsolvable anagrams and false feedback about success or not. The "near" (similar) brand extension were television and VCR while the "far" (dis-similar) brand extension were skis and bicycle to the "core brand" of television.

On the other hand, with low prior knowledge about the category, a moderately different new category member is liked better than extremely similar or dis-similar ones. This is the moderate incongruity effect (Peracchio and Tybout 1996).

The new category member can influence the perception of the whole category either enhancement or dilution. This is an updating of perception of the whole brand category based on experiences with the new product (Erdem



1998).

The perception of the category is influenced by another set of factors known as goal-derived categories (Loken 2006). This is the reason for the use of the brand or product. In fact, there may be simultaneous goals which can conflict. For example, the goal-driven categories may be "healthy foods" and "easy to make for dinner". A new product which combines both of these goals will be viewed differently to a product that fulfils one but not the other.

### Consumer Inferences

Consumers make inferences about products in the same way as individuals do about people they meet (social perception). In social perception the "halo effect" is where an individual with a specific positive attribute (specific perception) is assumed to be positive as a whole (global perception). So with products. When an advertisement pointed out cost savings for a particular brand, this brand was assumed to be superior on other attributes as well (Pechmann 1996). Highly motivated individuals are more likely to make such spontaneous inferences about products (Loken 2006).

This is typically studied by showing individuals incomplete information about a product to see if it is later recalled as complete. This idea builds on the work on the recall of inferences as facts in, for example, eye-witness testimony.

A number of factors can influence the inferences made and later recalled about a product (Loken 2006):

- Irrelevant attributes - irrelevant information can lead to negative views about a product;
- Experience - "experience information" is more influential than advertising except where product familiarity is low;
- How information comes to mind - the ease with which relevant information is recalled;
- Language used - eg: brand names implying superiority (eg: "Lifelong Luggage") produced better recall of related product attributes and less recall of non-related attributes than non-suggestive names (eg: "Ocean Luggage") (Keller et al 1998)(table 4);
- Cognitive biases - as in the attribution process, individuals do not assess all the information available equally, like a computer, but use shortcuts/heuristics (assumed to be correct) to aid decision-making.

One bias relates to how alternatives are framed. In the case of a fee in shops for paying by credit card (framed as a loss), this is less acceptable to consumers than discount for paying cash instead of credit card (framed as a gain)(Tversky and Kahnemann 1981).

PRODUCT	SUGGESTIVE NAME	NON-SUGGESTIVE NAME	RELATED PRODUCT ATTRIBUTE	UNRELATED PRODUCT ATTRIBUTE
Camera	EasyPro	Watson	Ease of use	Flexibility and attachments
Luggage	LifeLong	Ocean	Durability	Fashionable appearance
Personal computer	CompuQuick	Criterion	Speed and ease of use	Compatibility
Television	PicturePerfect	Emporium	Superior picture	Superior sound
Tennis racquet	PowerStroke	Crown	Powerful performance	Special design for men and

(After Keller et al 1998)

Table 4 - Suggestive and non-suggestive brand names created by Keller et al (1998).

## Consumer Evaluation and Emotions

In reality, many decisions about buying are emotion-related rather than logical decisions. The strongest effect being positive mood which increases preference for a product unless an impression of a product has already been made (Yeung and Wyer 2004).

It may be that individuals in a positive mood engage in less analytical processing than those in a negative mood, and are more concerned with maintaining the positive mood irrelevant of decision-making errors. This is not so if the stakes are high (Loken 2006).

On the other hand, "mood-ameliorating" products, like alcohol and chocolate, increase in sales when moods are negative (Shavitt and Wänke 2001).

Companies want to associate their products with positive moods, so should they place their advertisements in the middle of comedy programmes on television rather than documentaries or dramas? Mattenklott (1998; quoted in Shavitt and Wänke 2001) found that advertisements in the middle of funny programmes were better recalled than during sad programmes, but advertisements in neutral programmes were the best recalled. It seems that these advertisements stood out from the neutral programmes (ie: memorable) and thus increased recall of the products. However, the tone of the advertisement should link to the type of television programme. For example, a "sad"

advertisement encouraging drug addicts to seek professional help was better recalled in the middle of a sad programme than a happy one (Kamins et al 1991).

A brand or product is not evaluated in an objective way by weighing up costs and benefits. For example, the price can influence purchase in a counter-intuitive way - ie: a more positive attitude towards more expensive products even if the quality is the same as cheaper priced ones. Plassmann et al (2008) compared ratings of taste for different wines based on price, and individuals were in a functional magnetic resonance scanner during the experiment <sup>5</sup>.

The twenty participants were given a sample of red wine (Cabernet Sauvignon) or a tasteless control liquid to keep in their mouth for ten seconds before swallowing, and then to rate the pleasantness. Three differently priced wines were used, and their price was sometimes falsely given: for example, \$5-bottle wine given with real price, and later as \$45-bottle wine. Rating of pleasantness increased with price of wine (real or false)(table 5), and increased blood flow to the medial orbitofrontal cortex was associated with pleasantness. So individuals are not just saying that a more expensive wine tastes nicer, but they are actually experiencing it.

The research also showed that experienced pleasantness is computed by the brain "in a much more sophisticated manner that involves integrating the actual sensory properties of the substance being consumed with the expectations about how good it should be" (p1052).

WINE	PRICE (\$)	LIKING RATING KNOWING PRICE	LIKING RATING NOT KNOWING PRICE*
1	5 (real) 45 (false)	2.0 3.5**	4.0 4.2
2	10 (false) 90 (real)	2.7 4.0**	3.5 3.6
3	35 (real)	3.0	2.8
Neutral	-	2.0	-

\* = 8 weeks later

\*\* = significant at  $p < 0.001$

(After Plassmann et al 2008)

Table 5 - Approximate mean rating of liking of wine based on knowledge of price.

## PERSUASION

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<sup>5</sup> This overcame demand characteristics of participants not admitting to liking cheaper wine.

The history of the research on attitudes in social psychology has been directly or indirectly related to changing consumers' attitudes and behaviour. Recent models of persuasion are linked to the dual-process of elaborative or peripheral routes to changing attitudes (eg: Petty and Cacioppo 1986). For example, highly motivated consumers engage in more elaborative processing, and were more influenced by negatively-framed messages, and argument strength (versus number of arguments) than those using peripheral route processing (Loken 2006).

Elaborative processing was more likely in response to messages from untrustworthy than trustworthy sources (Priester and Petty 2003).

Advertising is different to traditional research on persuasion because it involves visual elements whereas traditional research tended to focus upon the content of the message. Visual elements can be peripheral cues for low motivated consumers, and elaborative cues for highly motivated consumers. For example, full colour advertisements may swamp the available cognitive resources during elaborative processing and thus be less effective than black and white ones, while the colour advertisements are more effective in peripheral processing (Shavitt and Wänke 2001).

Advertising is also different to traditional persuasion research because individuals may enjoy watching advertisements for their own sake rather than just as a means of product communication, particularly if the advertisements are amusing or dramatic (Shavitt et al 1998). Table 6 lists some of the results from the this 1000-person US telephone survey.

QUESTION	TOTAL SAMPLE %	DEMOGRAPHIC DIFFERENCES
In general, do you like or dislike advertising?	Like 44 Dislike 25.2	Most "like": 18-34 yrs Most "dislike": 55-64 yrs
I like to look at most of the advertisements that I'm exposed to	Agree 51.7 Disagree 36.8	Most "agree": 18-34 yrs Most "disagree": 55-64 yrs
Most advertising is	Agree 61.1	Most "agree": 55-64 yrs

(After Shavitt et al 1998)

Table 6 - Selection of results from US telephone survey by Shavitt et al (1998).

It has been found that there is a difference between

the "attitude-toward-the-brand" (A-brand) and the "attitude-toward-the-advertisement" (A-ad)(Shavitt and Wänke 2001). This includes a scepticism towards the advertisement, but a positive view towards the brand. Advertisement scepticism is linked to higher self-esteem and less influencability (Obermiller and Spangenberg 1998). Scepticism can be of the literal truth of claims of advertising, of the motives of the advertisers, of the value of the information to the individual and society, and of the appropriateness for specific audiences and specific products. Obermiller and Spangenberg developed the nine-item SKEP scale (table 7).

1. We can depend on getting the truth in most advertising.
2. Advertising's aim is to inform the consumer .
3. I believe advertising is informative.
4. Advertising is generally truthful.
5. Advertising is a reliable source of information about the quality and performance of products.
6. Advertising is truth well told.
7. In general, advertising presents a true picture of the product being advertised.
8. I feel I've been accurately informed after viewing most advertisements.

(After Obermiller and Spangenberg 1998 Table 1 p171)

Table 9 - The SKEP Scale.

The Persuasion Knowledge Model (PKM)(Friestad and Wright 1994) was developed to explain how individuals approach advertising. It includes an individual's beliefs about how advertisers work generally (persuasion knowledge) and specifically that advertiser (agent knowledge)(lay knowledge about persuasion), and knowledge about the product (topic knowledge) in order to evaluate the claims of the advertisement. For example, an excessively high repetition of an advertisement can lead consumers to question what is wrong about the brand.

The type of advertisement that persuades in one culture may not be the same in another. For example, Han and Shavitt's (1994) content analysis of magazine advertisements in the USA and South Korea found differences. In the latter culture, advertisements are more focused on family benefits (eg: washing powder cleans clothes that the whole family will love) as it is a collectivist culture. In the USA (an individualistic culture), advertisements emphasised individuality and independence (eg: washing powder cleans clothes you will love).

#### CONSUMER SOCIETY AND IDENTITY

Living in a consumer society means that products and brands are more than just things that are consumed, they are part of who individuals are. For example, characteristics of friendliness and assertiveness were attributed to a person in a video depending upon the material possessions they appeared with (Dittmar 1992).

Dittmar (2002) argued that individuals are entirely embedded in the social context and that material goods influence the perception of others and the representation of the self and identity: "people often buy consumer goods because of their psychological benefits, rather than their economic and utilitarian value" (p206). For example, an expensive watch from a grandparent represents social status, and the emotional link to the family.

Dittmar (1989) used the "treasured possessions" paradigm by asking individuals to choose their five most important material possessions and to say why. There were gender differences in the reasons given. For men, they related to practical and control reasons, like the sense of interdependence from owning a car, and women emphasised interpersonal relationships and emotional significance (eg: jewellery given by a significant other person).

## Consumer Socialisation

If consumer products and brands are so important to individuals today, then it is due to a socialisation process. The process of socialisation involves children learning the norms of their society and culture. it varies from "table manners" to the accepted meanings underpinning the world. Being raised in a consumer society socialises children into the norms of that society. There are different aspects to this process related to the understanding of advertising and brands, and the meaning of possessions.

## Understanding Advertising

The process of "consumer socialisation" is relatively new in history, but the second half of the twentieth century has seen the vast increase in marketing and advertising. John (1999) has suggested three stages of children's understanding of advertising similar to stages of cognitive development:

i) Perceptual stage (3-7 years old) - Children view adverts at face value as funny and interesting. Understanding of a promotional message occurs by the end of the stage.

Children as young as six have a conception of what is "cool" (fashionable) and not (Pole et al 2006 quoted in Williams 2006).

ii) Analytical stage (7-11 years old) - By seven years old children understand adverts are designed to persuade, and distinguish them from other programmes. There is a recognition of brand names and development of the concept of shopping.

iii) Reflective stage (11-16 years old) - This stage sees a "heightened awareness of other people's perspectives, along with a need to shape their own identity and conform to group expectations, results in more attention to the social aspects of being a consumer, making choices, and consuming brands" (John 1999 p187).

### Meaning of Possessions

Research on the meaning of possessions have linked them to the perception of the self.

Kemptoner (1991 quoted in Phoenix 2005), using questions with different age groups of Californians (both children and adults), found differences in most valued possession. Pre-teens valued toys that gave comfort and security, whereas adults identified objects associated with social relationships and identity. This change in preference appeared in the mid-teens.

Furby (1978) explored the meanings of possessions in the US and Israel. One hundred and fifty US participants (30 each from five groups - kindergarten, 6-7 years old, 10-11 years old, 16-17 years old, and 40-60 years old), and 120 Israeli were interviewed. Pre-teens emphasised the positive affect associated with valued objects in both samples. Older teens in the US related their valued objects more to social power and status.

### Brands as Symbols of Status in Adolescence

Anderson (2004) interviewed forty adolescents and adults in Liverpool about personal possessions that "say something about you". Adolescents chose more branded goods, and referred to brands more when talking about themselves. A product like a mobile phone type provides a sense of belonging with other owners of the same make, but also individuality with specific ringtones. The participants were then asked to rate individuals in photographs wearing certain brands. The adolescents described "brand personalities" in positive and negative ways depending on the products. Overall the adolescents were very conscious of brand signals.

Not everybody admits to being concerned with buying brands. But "Positioning yourself against brands does, however, influence what young people can do as much as being determined to buy brands" (Phoenix 2005 p237). In other words, denying brands emphasises their importance in the social world.

## NEGATIVE ASPECTS OF CONSUMERISM

The "dark side" of consumer goods having such a dominant place in individuals' lives are "materialistic values". "Material value orientation" is where the individual ascribes "to the ownership and acquisition of material goods as achieving major life goals" (Richins 2004). Consumer goods, thus, become:

- a central life goal;
- the main route to identity, success, and happiness;
- the criterion for evaluating the self and others (Dittmar 2004).

Individuals with a stronger commitment to such values have more unrealistic expectations about consumer goods, experience more negative emotions after purchasing, and report less life satisfaction (Dittmar 2004).

Another "dark side" of consumerism is "compulsive buying" or "excessive buying" (Dittmar 2004). Between 2-13% of adults in Western consumer societies are estimated to be compulsive buyers (Dittmar 2005).

Beyond the instrumental aspects of buying (ie: what the product does), psychological motivations to shop have been identified - social-experiential, emotional, and identity-related benefits. Social-experiential motives relate to social aspects of shopping, like going with friends. Emotional motives include the "buzz" as well as motives "to regulate or repair one's emotions, where individuals shop and buy in order to improve their mood" (Dittmar et al 2007), while identity-related motives include self-expression, and improving one's social image.

Compulsive buying can be seen as a "self-medication" for negative emotions more than non-compulsive consuming. Identity-related motives are also important in compulsive buying (Dittmar et al 2007).

Vulnerability to compulsive buying has been also been linked to materialistic values (Dittmar 2005).

Dittmar et al (2007) investigated compulsive buying and motives and values in online shopping. Initially (study 1), data were collected from undergraduates at the



University of Sussex who had bought goods online (n = 110) from a wider survey of "students as consumers". Respondents were asked to rate different statements about buying motives on a six-point Likert scale (1 = strongly disagree; 6 = strongly agree). Table 8 gives examples of the questionnaire items.

#### ECONOMIC BENEFITS

- I like to compare prices carefully before I buy
- It is important to me that goods I buy are good value for money

#### EFFICIENCY

- Saving time while buying goods is important to me
- I want buying to be as fast and as efficient as possible

#### PERCEIVED IDENTITY GAINS

- I like to buy things that impress other people
- I buy consumer goods because they give me "prestige"

#### EMOTIONAL ENHANCEMENT AND MOOD REGULATION

- I get a buzz from buying things
- I often buy things because it puts me in a better mood

Table 8 - Examples of questionnaire items about motives for online shopping used by Dittmar et al (2007).

Economic benefits (mean = 4.88) and efficiency (mean = 4.51) were the most important motives for online shopping. But perceived identity gains (mean = 3.27) and emotional enhancement and mood regulation (mean = 3.33) were also shown to play a part. This was the first study to show psychological motives as important in online shopping. The data were collected in 2003. Before this point, it was generally assumed that online shopping was for convenience and price.

Study 2 recruited 126 online buyers from the students at the University of Sussex with the aim of exploring the psychological motives in more detail, and the links to compulsive buying. The questionnaire included sections on the motives for online shopping (as in study 1), a version of the Materialistic Value Survey (MVS)(Richins 2004), and a modified version of the Compulsive Buying Scale (CBS)(d'Astous et al 1990). The CBS measures three core features of the behaviour:

i) Irresistible buying urges - eg: "As soon as I enter a shopping centre, I want to go in a shop and buy something";

ii) Loss of control - eg: "I sometimes feel that something inside pushes me to go shopping";

iii) Continuing despite negative consequences - eg: "I have often bought a product that I did not need even

when I knew I had very little money left".

About 10% of the respondents reported behaviour that could be classified as compulsive buying online. Compulsive buying online was predicted by stronger perceived identity gains and emotional enhancement and mood regulation motives, but not economic benefits and efficiency motives. Endorsing materialistic values, in turn, predicted strong identity and emotional motives. There was no significant direct relationship between materialistic values and compulsive buying (figure 3).

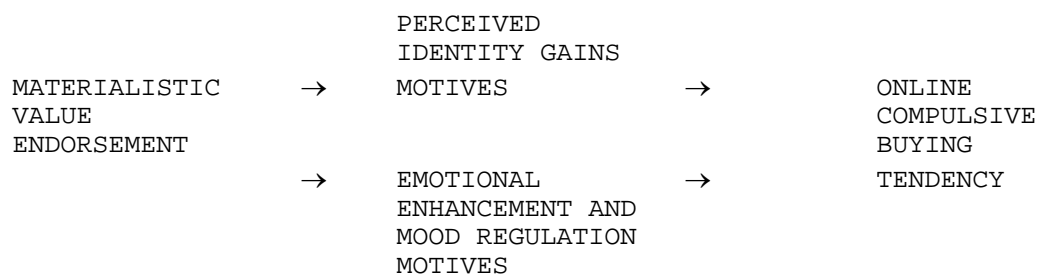


Figure 3 - Nature of significant relationship between variables found by Dittmar et al (2007).

This relationship is consistent with findings for conventional compulsive buying. Materialistic value orientation and high CBS score were found among three samples - individuals contacting compulsive buying self-help groups and matched controls (n = 330), consumer testing panel (n = 350), and 16-18 year-olds (n = 195)(Dittmar 2005).

Dittmar et al (2007) was the first study to show that online compulsive buying is the same as the conventional type.

## NEUROECONOMICS

Neuroeconomics is an attempt to combine ideas from economics and from psychology and neuroscience. It makes use of the latest technological developments to scan the brain. It developed in the 1990s and, in particular, has challenged the rational choice model that dominated economics (Loewenstein et al 2008). This is the idea that consumers rationally assess costs and benefits in order to maximise their profits.

Much of neuroeconomics is describing the specific brain areas in economic and consumer decision-making. It has been called the "new phrenology" (Harrison 2005) where brain areas rather than bumps on the skull (as in the original phrenology) are the focus for explaining behaviour.

Three areas have been studied most in neuroeconomics - decision-making under risk and uncertainty, inter-temporal choice, and social decision-making.

The most important challenge to economics from neuroeconomics is that decision-making is not a unitary process, but rather driven by multiple systems and processes (like the rational and the emotional)(Loewenstein et al 2008).

## Decision-Making Under Risk and Uncertainty

When choosing between options, there is usually uncertainty about the consequences of a decision. So decisions are made under conditions of risk. Traditionally, economics has explained such decision-making with "expected utility". The option with the greatest expected utility (weighing up the desirability of possible outcomes) will be chosen. However, individuals are not dispassionate information-processors and decisions are influenced by emotions.

For example, individuals will make riskier decisions because they dislike losses more than they like gains ("loss aversion")(Tversky and Kahneman 1991).

An individual is faced with a gamble involving a 50% chance of winning £20 and a 50% chance of losing £10. The individual starts with £1000, and after the gamble will end up with £990 or £1020. It has been noted that individuals tend to focus upon the gamble in isolation rather than more widely to include their wealth overall. Neuroeconomic studies have found that this tendency may be due to neural activity in areas in the prefrontal cortex and the neurotransmitter, dopamine (eg: Knutson et al 2003).

Knutson et al (2003) fMRI scanned twelve volunteers while performing 144 trials of the monetary incentive delay (MID) task. This involved one of seven different shapes appearing on a screen briefly (250ms). Each shape denoted either a win (eg: circle with three horizontal lines = \$5.00), a loss (eg: square with two horizontal lines = \$1.00), or nothing (triangle). Pressing a button within a certain time (160-260ms) obtained the gain or avoided the loss. Participants were told immediately if they had pressed the button quick enough. There was a hit rate of about two-thirds.

When participants received the expected reward, activity in the mesial prefrontal cortex increased, but decreased when the expected reward did not arrive (ie: not pressed button quick enough).

The role of emotions in decision-making has been linked to the ventromedial prefrontal cortex (VMPFC). Bechara et al (1997) compared individuals with damage to

this area with healthy controls on a gambling task. The aim of the task was to gain as much money as possible based on choosing a card from a choice of four. Two of the cards were high risk and two were not. The high risk cards were either substantial gains or losses. Both groups of participants made risky decisions, but it was the behaviour after the gamble failed (ie: a substantial loss was made) that was different. Healthy controls took longer to return to the risky decisions, and stayed with safer cards than the VMPFC-damaged participants (appendix 2).

Shiv et al (2005) found that individuals with damage to either the amygdala, the orbitofrontal cortex, the right insular cortex or the somatosensory cortex (all areas related to emotions) made riskier decisions on a coin-toss gambling game than healthy controls.

Much of the research uses known probabilities (eg: 50% chance), but real life contains ambiguity (ie: the probability is not known). Individuals behave differently with the latter, and it seems that the amygdala and orbitofrontal cortex are involved (Hsu et al 2005). These areas were more active when gambling under ambiguous odds (eg: an unknown chance of turning over the winning card) compared to a clear probability (eg: a 50% chance of the winning card). The same areas of the brain were activated when the gamble was based upon certain knowledge (eg: facts about New York) and ambiguous knowledge (eg: facts about other countries).

In the main, Hsu et al used a task based on the Ellsberg paradox (Ellsberg 1961). There are two decks of 20 cards. One deck contains half red and half blue cards (the risky deck) and the other deck has an unknown combination of the colours (the ambiguous deck). The player bets on the colour of the next card. Originally, Ellsberg used coloured balls in an urn.

Hsu et al also tested twelve patients with damage to the orbitofrontal cortex, and they did not distinguish between certain and ambiguous risk, and gambled the same way in both cases.

Loss aversion has also been linked to the "endowment effect" (Thaler 1980) ("the tendency for people to value an object more highly if they possess it than they would value the same object if they did not"; Loewenstein et al 2008; p653). In a study to test this, Kahneman et al (1990) gave one group of participants an object as a gift<sup>6</sup> for attending, and then offered them various amounts of money to sell it. Another group were offered a choice between the object and various amounts of money. Technically, both groups are faced with the same choice,

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<sup>6</sup> Cornell University coffee mug, box of ballpoint pens or folding binoculars.

but the former group held out for significantly more money.

In a similar type of study, Weber et al (2007) found that the amygdala was active with the endowment effect. However, the design of this experiment was not a complete replication (Loewenstein et al 2008).

### Inter-Temporal Choice

Inter-temporal choice is decision-making where the costs and benefits are distributed over time (Loewenstein et al 2008). For example, eating a chocolate bar versus adhering to a diet. The benefits of the chocolate are now (eg: pleasure, reduce hunger), whereas the costs are later (eg: weight gain), and the opposite for adhering to the diet.

McClure (2004) compared the brain activity in choices of small rewards now or larger delayed rewards. The limbic system was more active in the former, and the fronto-parietal cortex in the latter. The limbic system has a lot of dopamine neurons, and this neurotransmitter is known to be active in "feeling good".

An element in inter-temporal choice is opportunity costs. Any purchase now means that the money used is not available for something else in the future. A future pleasure is forgone, though this more likely to be an implicit aspect of decision-making. Drawing attention to opportunity costs reduces willingness to buy now (Frederick et al 2006).

Consumers' decisions are more often influenced by anticipatory "pain of paying" (Prelec and Loewenstein 1998). Rick et al (2007) developed a Spendthrift-Tightwad (ST-TW) scale to measure this (table 9). "Tightwads" spend less now than they would ideally like to spend because they are aware of the opportunity costs of this purchase. "Spendthrifts" are the opposite and spend more now than they would ideally like.

This goes with the idea of impulsive buying at one end and "hyperopic" consumers (Kivetz and Simonson 2002) at the other. The latter are "excessively farsighted".

Mr.A is accompanying a good friend who is on a shopping spree at a local mall. When they enter a large department store, Mr.A sees that the store has a "one-day-only-sale" where everything is priced 10-60% off. He realises he doesn't need anything, yet can't resist and ends up spending \$100 on stuff.

Mr.B is accompanying a good friend who is on a shopping spree at a local mall. When they enter a large department store, Mr.A sees that the store has a "one-day-only-sale" where everything is priced 10-60% off. He figures he can get great deals on many items that he needs, yet the thought of spending the money keeps him from buying

the stuff.

In terms of your own behaviour, who are you more similar to,  
Mr.A or Mr.B?

1	2	3	4	5
Mr.A		About the same or neither		Mr.B
(spendthrift)				(tightwad)

(After Rick et al 2007)

Table 9 - Example of item from ST-TW scale.

### Social Decision-Making

This is how individual act towards other people in terms of altruistic and selfish decisions. It is tested by scenarios like the "trolley" dilemmas (Thomson 1986) where an empty runaway trolley (train) is heading towards five people, for example. One alternative is hitting a switch to change the trolley's direction and kill one person. Or pushing a large stranger (ie: individual themselves is not heavy enough) in front of the trolley will save five people. Respondents tend to find the former morally acceptable, but not the latter (thought it the same outcome)(Loewenstein et al 2008). Brain regions that process emotional information are active in response to these dilemmas more than in choices between two types of travel, for example (Greene et al 2001).

Social decision-making is often tested by tasks like the "Ultimatum Game" (Guth et al 1982). This involves two players - the proposer and the responder. The proposer is given a certain amount of money, but must offer some (how ever much they like) to the respondent. If the respondent accepts, both players get the amount agreed, but if the respondent refuses the offer, neither player gets any money. A self-interested strategy would be for the proposer to offer the minimum, and the respondent to accept anything. But the average offers are between 30-50% of the money, and offers less than 30% are frequently rejected (Loewenstein et al 2008).

"Objecting to unfairness has been proposed as a fundamental adaptive mechanism by which we assert and maintain a social reputation.. and the negative emotions provoked by unfair treatment in the Ultimatum Game can lead people to sacrifice sometimes considerable financial gain in order to punish their partner for the slight" (Sanfey et al 2003 p1756).

Sanfey et al (2003) studied nineteen Ultimatum Game responders while in the fMRI scanner. The offers were experimentally manipulated as fair (eg: 50/50) or unfair either from a supposed human proposer or a computer

(figure 4). Ten different offers from humans or computers were used - 50% (five trials), 30% (one trial), 20% (two trials), and 10% (2 trials). There were also ten control trials where participants received money for pressing a button. The participants were introduced to ten people who were supposed to be the proposers before the experiment began.

Responders were less likely to accept unfair offers from human proposers (table 10), and had greater activation of the anterior insula region of the cortex. This area of the brain is part of the "cortical pain matrix". So unfair offers were creating an "emotional pain" (Loewenstein et al 2008).

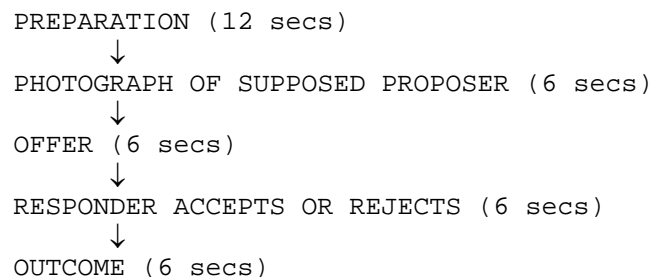


Figure 4 - Procedure used by Sanfey et al (2003).

But when respondents accepted unfair offers (from humans or computers), the right dorsolateral prefrontal cortex (DLPFC) was more active. This was interpreted as a "rational" over-riding of the emotional impulse to reject unfair offers.

Asked later, 58% of the participants saw any offer less than 50% as unfair, and the rest as less than 30%.

This study used deception in telling the participants that a particular human proposer was actually making that offer. This was not suspected by the participants as reported in post-experimental interviews nor in a diminished emotional reaction during the game. Nor did the early participants communicate to later ones what had happened ("possible contamination of the participant pool") as results were similar across first to last groups of participants).

Knoch et al (2006) applied repetitive transcranial magnetic stimulation (rTMS) to the right DLPFC area (which temporarily "turned off" the neurons), and responders accepted more unfair offers despite knowing that they were unfair.

Fifty-two participants in Switzerland were offered either 50%, 40%, 30% or 20% of 20 Swiss francs with rTMS to the right or left DLPFC or "sham". 44.7% of responders accepted the 20% offer with rTMS to the right DLPFC, 14.7% to the left and 9.3% with "sham" rTMS.

OFFER	COMPUTER	"HUMAN"
50%	100	100
30%	90	90
20%	80	50
10%	70	40

Table 10 - Approximately percentages of responders accepting offers.

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## APPENDIX 2: SOMATIC MARKER HYPOTHESIS: EMOTIONS AND DECISION-MAKING

The role of emotions in decision-making has been proposed in the "somatic marker hypothesis" (Damasio 1994). The theory makes a number of assumptions (Bechara et al 2000):

- Decision-making depends "on many levels of neural operation, some of which are conscious and overtly cognitive, some of which are not";
- "Cognitive operations" depend on "support processes" like attention, working memory, and emotion;
- Decision-making depends on the availability of knowledge about the situation, choices, and outcomes. This is called "dispositional knowledge", and is stored in different areas of the brain;
- Dispositional knowledge takes different forms including facts, images, and individual experiences. The link between facts and emotions previously paired with the individual experience resides in the ventromedial prefrontal cortex (VMPFC). The information itself does not reside here, but "rather the potential to reactivate an emotion by acting on the appropriate cortical or sub-cortical structures" (Bechara et al 2000).

In other words, individual experience of a past situation is encoded with emotional associations, which are reactivated when a decision about a similar situation is required. The reactivation works via a "body loop" either consciously or non-consciously (these are "somatic markers").

### WORK WITH VMPFC DAMAGED PATIENTS

The somatic marker hypothesis has been tested with individuals with VMPFC damage. The standard test for measuring decision-making is the "gambling task" (Bechara et al 1994). This involves four decks of cards from which the participant chooses one card at a time with the aim of making a profit. Most cards contain gains, but some are losses. Decks A and B are risky with high gains (\$100 per card), but high losses (1 in 10 cards = \$1250 loss). Decks C and D are less risky with \$50 gains and a loss of \$250 on every tenth card. The participants do not know these rules beforehand.

If individuals choose ten cards only from decks A and B, they end up losing \$250, but with decks C and D it

is a gain of \$250. Overall, the game involved 100 card choices.

Over the course of the gambling task, healthy controls and individuals with damage to areas of the brain other than the VMPFC choose more cards from decks C and D after initially choosing from A and B, whereas individuals with VMPFC damage continue to select from the A and B decks throughout the task (table 11)(Bechara et al 2000).

	VMPFC PATIENTS	HEALTHY CONTROLS
First choices (0-20)	Mostly A & B decks	Mostly A & B decks
Middle choices (41-60)	Similar numbers from all decks	Increasing choices from C & D, reducing choices from A & B
Final choices (81-100)	Mostly A & B decks	Mostly C & D decks

(A & B decks = risky decision which end in loss; C & D decks = less risky ending with gain)

Table 11 - Summary of card choices by controls and VMPFC patients.

Healthy controls learn from the experiences of choosing the risky cards at the beginning to become more conservative by the end of the game. VMPFC patients do not learn this, and return to risky choices by the end of the game.

Furthermore, when the participants were retested after varying time intervals (from one day to six months), healthy controls immediately selected from decks C and D while VMPFC patients still showed risky decision-making (table 12)(Bechara et al 2000).

	VMPFC PATIENTS	HEALTHY CONTROLS
First time	-20	+20
24 hours later	-20	+70
6 months later	-40	+80

(Minus = mostly A and B decks; plus = mostly C and D decks)

(After Bechara et al 2000)

Table 12 - Total number of cards selected from decks C and D minus total number of cards from decks A and B.

If skin conductance response (SCR) is used as a measure of arousal, healthy controls develop an

increasing response in anticipation of picking up the card as the game progresses which VMPFC patients do not (table 13) <sup>7</sup>. Both groups showed an equal SCR to gain or loss (Bechara et al 1996).

	VMPFC PATIENTS	HEALTHY CONTROLS
Start of game	little (0.2 units)	little (0.2)
End of game	none (<0.1)	large (0.4-0.8)

Table 13 - Anticipatory SCR during the gambling task.

In a further experiment (Bechara et al 1997), participants were asked to explain their choice of cards. As the game progressed most controls developed a "hunch" about the risky and non-risky decks which eventually became a clear understanding of the pattern. However, 30% of controls could not explain the pattern, though they still chose mostly from decks from C and D. Only half of the VMPFC patients could explain the pattern of the cards, but they still made risky decisions. "These patients may 'say' the right thing, but 'do' the wrong thing" (Bechara et al 2000).

Bechara et al (1998) investigated nine VMPFC patients' working memory to see if impairments in this process explained the above results. A delay task was used. Four cards were presented briefly on a computer screen, and after a time delay and distraction, the participant must recall one of the conditions from a choice. Five of the patients scored poorly on the delay task and four scored normally. The difference was found to be due to the exact VMPFC damage. Memory problems were associated with posterior VMPFC damage and not anterior damage (Bechara et al 2000).

Another avenue explored with VMPFC patients was the ability to re-experience emotions. Participants were asked to talk about highly emotional personal events while physiological measures were taken. Then they were asked to re-experience the emotion of that event. The VMPFC patients were able to re-experience anger, less so fear, and not happiness or sadness. This could mean that the risky and poor decision-making in the gambling task was because they were not able to experience the emotion associated with the event (Bechara et al 2000).

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<sup>7</sup> But this was not due to a failure of the conditioned response as shown by pairing a loud noise with a particular colour in another experiment (Bechara et al 1995).

## CONCLUSION

Overall:

The somatic marker hypothesis proposes that individuals make judgments not only by assessing the severity of outcomes and their probability of occurrence, but also and primarily in terms of their emotional quality. Lesions of the VM prefrontal cortex interfere with the normal processing of somatic or emotional signals, but leave other cognitive functions minimally affected. This damage leads to pathological impairments in the decision making process which seriously compromise the efficiency of everyday life decisions (Bechara et al 2000 p305).

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